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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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07/01/2005

Akihiko Namba

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09/29/2008

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JAPAN

EXAMINER

SINGAL, ANKUSH K

ART UNIT

PAPER NUMBER

2895

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/541,184	Applicant(s) NAMBA ET AL.	
	Examiner ANKUSH k. SINGAL	Art Unit 2895	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06/27/2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 2-4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over A.M.Zaitsev(Optical properties of Diamond- A data Handbook 2001) .

Re. claim 2, Zaitsev discloses a method of manufacturing n-type semiconductor diamond, comprising: a step of producing diamond incorporating Li and N by implanting into single-crystal diamond essentially not containing impurities Li and N ions and the annealing step of diamond incorporating Li and N.

However, Zaitsev does not teach that the diamond is not type IIa or undoped epitaxial diamond and the Li ions at a dose of at least $3.0 \times 10^{15} \text{ cm}^{-2}$ and the Li and N sub-total dose is $7.0 \times 10^{15} \text{ cm}^{-2}$ the ion-implantation depths at which the post-implantation Li and N concentrations each are at least 1600 ppm will overlap; and a step of annealing at a temperature in range of from 800.degree. C. to less than 1800.degree. C, under high –pressure conditions of at least 3 GPa and diamond has a sheet resistance of not greater than $1.4 \times 10^4 \text{ } \Omega/\text{square}$. Zaitsev also teaches the annealing behavior of the H3 center strongly depends on the type diamond and irradiation conditions. However Zaitsev disclosure for given conditions of the claimed invention, the claim

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range is considered to be an obvious matter of finding an optimum workable range for some chosen design requirement utilizing Zaitsev method.

Note that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves routine skill in the art. In re Aller, 105 USPQ 233.

Any difference in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Re. claim 3, Zaitsev discloses all the limitations including implantation of Li and N in diamond and then annealing but does not teach the diamond is not type IIa or undoped epitaxial diamond and the Li ions at a dose of at least $3.0 \times 10^{15} \text{ cm}^{-2}$ and the Li and N sub-total dose is $7.0 \times 10^{15} \text{ cm}^{-2}$ and a step of implanting the ions so that ion-implantation depths at which the post-implantation Li and N concentrations each are at least 1600 ppm will overlap, and so that the Li and N sum-total dose is less than or equal to $5.0 \times 10^{15} \text{ cm}^{-2}$ and annealing temperature to be between 800.degree. C. to less than 1800.degree. C under high-pressure conditions of at least 3 GPa and diamond has a sheet resistance of not greater than $1.4 \times 10^4 \text{ } \Omega/\text{square}$. However Zaitsev disclosure for

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given conditions of the claimed invention, the claim range is considered to be an obvious matter of finding an optimum workable range for some chosen design requirement utilizing Zaitsev method.

Note that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves routine skill in the art. In re Aller, 105 USPQ 233.

Any difference in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Re. claim 4 as discussed above in claim 3, Zaitsev discloses all the limitations as discussed above in claim 1 except ion-implantation apparatus having an electron-beam line and two ion-beam lines is utilized to implant the Li and N ions simultaneously while radiating with the electron beam the single-crystal diamond that is ion-implanted, but Zaitsev also teaches that the implantation apparatus depends on the type of diamond used. However Zaitsev disclosure for given conditions of the claimed invention, the claim range is considered to be an obvious matter of finding an optimum workable range for some chosen design requirement utilizing Zaitsev method.

Note that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves routine skill in the art. In re Aller, 105 USPQ 233.

Any difference in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Re. claim 6, Zaitsev discloses the Semiconductor diamond being n-type, but does not teach the diamond is not type IIa or undoped epitaxial diamond and incorporating, from a crystal face thereof to the same depth, at least 1600 ppm of each of Li and N, and having a sheet resistance of not greater than $1.4 \times 10^4 \Omega/\square$ or less. However Zaitsev disclosure for given conditions of the claimed invention, the claim range is considered to be an obvious matter of finding an optimum workable range for some chosen design requirement utilizing Zaitsev method.

Note that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves routine skill in the art. In re Aller, 105 USPQ 233.

Any difference in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Response to Applicant's Argument's

In response to applicant's arguments, Page 5, lines 17-21, "Hence for the office to base its rejection on the ground that the claimed ranges ... an obvious matter of finding an optimum workable range" is to reject subject matter directed to properties of a product, but not to a method of manufacturing a product", since the claims have no criticality for the ranges the ranges can be considered as optimum workable ranges.

In response to applicant's arguments, Page 7, lines 6-12 "Zaistev does not teach the methods of the present invention bring about Li and N pairing, such that the Li-N pairs do not associate with vacancies but instead become electrically activated shallow donors....", the limitation is not cited in the claim.

In response to applicant's argument "the diamond is a type IIa diamond", Zaistev clearly explains that the annealing behavior of the H3 center strongly depends on the type of diamond and irradiation conditions.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANKUSH K. SINGAL whose telephone number is (571)270-1204. The examiner can normally be reached on Monday-Friday 7am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Richards can be reached on (571)272-1736. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Fernando L. Toledo/
Primary Examiner, Art Unit 2895

/Ankush k Singal/
Examiner, Art Unit 2895